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M E M O R A N D U M

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SUBJECT: **Staff Analysis for Draft Wastewater Reuse Permit LA-000214-01 (Municipal Wastewater) The Southfork Landing, Inc. (Southfork Landing Planned Unit Development)**

Purpose

The purpose of this memorandum is to satisfy the requirements of the *Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater* (*Reuse Rules*), IDAPA 58.01.17.400.04, for issuing wastewater reuse permits. This memorandum addresses draft Permit LA-000214-01, for the private, municipal wastewater treatment and reuse system to be owned and operated by The Southfork Landing, Inc., for the Southfork Landing Planned Unit Development (PUD), hereafter referred to as Southfork Landing or the permittee.

Summary of Events

A wastewater reclamation and reuse permit application was received on May 14, 2007, for Phase 1 of Southfork Landing. The application was determined incomplete on June 12, 2007. The incompleteness determination letter required additional information on 1) existing nutrient profiles in soil and infiltration test results, and 2) plans and specifications for the irrigation reuse and ground water recharge ponds in the equestrian center hydraulic management unit (HMU). The Department of Environmental Quality (DEQ) received a response letter and supporting information on September 11, 2007, and issued a completeness determination letter on October 9, 2007. The completeness letter also served as DEQ's preliminary decision to prepare a draft permit. Plans and specifications for construction of the recharge basins were also approved by DEQ on October 9, 2007.

A National Pollution Discharge Elimination System (NPDES) permit application has also been submitted to the U.S. Environmental Protection Agency (EPA), to allow for future surface water discharges directly to the South Fork Payette River. A mixing zone analysis, to assess potential impacts of surface water discharges to the river, was submitted to DEQ on January 15, 2008, and was approved for purposes of the draft reuse permit by DEQ's Water Quality Program Office in late February of 2008.

The permit application, preliminary engineering report for the treatment facility, and other supplemental information submitted by the permittee were used to develop draft Permit LA-000214-01 for a public review and comment period. After the public review period is closed, DEQ will provide written responses to all relevant comments and prepare a final permit for the Southfork Landing wastewater treatment and reuse facilities.

Site and Process Description

Southfork Landing is located approximately 1 mile south-southwest of Garden Valley, in Boise County. It consists of 861 acres located west of Alder Creek Road and 7 acres east of the road. This PUD will include a mixture of homes, community facilities and open spaces around the village center.

The Southfork Landing Wastewater Treatment Facility (SLWTF) will be located within the PUD and will treat wastewater generated by the PUD to the Class A level. The wastewater treatment plant will be an activated sludge system with biological and chemical nutrient removal. Wastewater will be collected by gravity collection lines, pumped to equalization basin and then pumped to the headworks for fine screening, activated sludge and filtration system treatment, and ultra-violet (UV) disinfection. Following disinfection, the Class A effluent will flow by gravity to one of three recharge basins or, pending issuance of the NPDES permit, to a river outfall. For purposes of the draft permit, all treated effluent is assumed to be reused for landscaping irrigation during growing season and ground water recharge during both the growing and non-growing season.

SLWTF will be built in three phases. The first two phases will be liquid treatment phases and the final third phase will consists of solids handling improvements by adding a screw press.

The activated sludge system uses a membrane bioreactor process with biological nutrient removal that reduces nitrogen levels in the influent water. The process will consist of two anoxic tanks, two aeration tanks, and two membrane bioreactor tanks. Design capacity of the activated sludge treatment system is based on 0.067 mgd average daily flow and 0.133 mgd peak day flow. A 7-day lined pond will be constructed near the recharge basins with capacity of 700,000 gallons to hold off-spec water. The wastewater facility is designed with complete redundancy from the equalization basin through the UV disinfection process. The redundant capacity will meet the requirements of an *equivalent backup system* capable of treating peak day flow as required by the *Wastewater Rules* (IDAPA 58.01.16.601.07.a.i.3). During Phases 1 and 2, sludge from the membrane reactor system will be aerated, decanted and stored at sludge holding tank and disposed at other large wastewater treatment facilities. After Phase 3, the liquid sludge will be thickened to 6-18% and disposed at the Idaho Waste Systems landfill in Ada County.

The recharge system will consist of one open irrigation/recharge basin (Recharge Basin 1) and two subsurface ground water recharge basins (Recharge Basins 2 and 3). Each of the three recharge units will have a footprint of approximately 0.25 acres and located on the Equestrian Center. The recharge system will be used on a year-round basis.

At the present time, Southfork Landing has only proposed two irrigation units for use during the growing season. The first, referred to as HMU-021401 in the draft permit, consists of landscape irrigation around SLWTF, while HMU-021402 is the pasture area referred to as the Equestrian Area. The permit application estimates the total area of these sites to be approximately 10 acres of irrigation area. Reclaimed wastewater will be pumped from Recharge Basin 1 by a skid-mounted pump irrigation system and applied to the HMUs during times of non-use by the public. Although the permit application did not include residential irrigation as a reuse proposal, the draft permit has been set up to facilitate such applications in the future (i.e., refer to Compliance Activity CA-214-04) if the permittee should elect to pursue it.

Soils Evaluation

The majority of the soils on site include three units: Palsen-Foxlane-Pay complex, Staircase sandy loam and Cloudyway fine gravelly sandy loam (Pharmer Engineering, 2007). Five test pits were excavated near Equestrian Center. The soils generally consisted of shallow layers of silty sand with organic matters overlain. Thin layers of clay and clayey sand were observed from 0.5 – 2.5 feet. Ground water was encountered in most of the excavation from 6-15 feet and capillary rise was noted to vary from 1 to 3 feet. Over-excavation of the ponds maybe necessary if the clay layers are encountered during construction of the recharge basins (P.E., 2007). Table 1 summarizes the soil properties pertaining to wastewater reuse (DEQ Guidance, 2007).

Table 1: Analytical test results of individual soil boring samples taken in June of 2007

Sample Identification	Soil Sampling Depth	Percent Moisture	Electrical Conductivity (umhos/cm)	Nitrate+ Nitrite (mg/kg)	NH3-N (mg/kg)	Ortho PO_4 (mg/kg)	pH
TP-1	0-7 ft.	5.2	53.0	< 1.1	5.3	7.31	6.18
TP-2	0-7 ft.	5.5	50.6	< 1.1	5.3	9.75	5.54
TP-3	0-7 ft.	9.9	60.2	< 1.1	8.3	4.06	6.42

Class A wastewater reuse sites do not typically require soil monitoring. Soil analysis results showed that existing nutrient levels are unlikely to be of concern for the proposal to irrigate with reuse effluent.

Surface Water Evaluation

The Southfork Landing PUD runs along the South Fork Payette River for less than one mile in the western portion of the South Fork Payette River sub-basin (HUC 17050120). The South Fork Payette River is a designated water body in the *Water Quality Standards*, IDAPA 58.01.02.140.14, with listed beneficial uses of domestic water supply, cold water communities, salmonid spawning, and primary contact recreation. In addition, the South Fork Payette River is a Special Resource Water, which is defined as a specific segment or body of water recognized as needing intensive protection to preserve outstanding or unique characteristics and/or to maintain current beneficial uses. The *Water Quality Standards* require that any point source discharge not cause a significant reduction in ambient water quality related to designated beneficial uses of the receiving water (refer to IDAPA 58.01.02.400.01.b). Detailed descriptions of beneficial uses of designated surface waters can be found in IDAPA 58.01.02.100. Charters Creek and Coski Creek are also located on the Southfork Landing property. The headwaters of creeks are 2500 feet upslope of the southwest of the site and 3000 feet upslope of the southeast of the site, respectively.

Ground Water and Hydrogeological Evaluation

Information about ground water at the site is included in the permit application and preliminary engineering report by Pharmer Engineering (2007). The South Fork Payette River valley contains at least two aquifers. One is located within the fractures and fault zones and recharged with precipitation. The second aquifer consists of multiple thin layers of ground water perched on silt and clay containing glacial sediments. The source of second aquifer is also precipitation. General ground water flow direction is north-northeast towards the South Fork Payette River. Drillers' reports reviewed by SPF Water Engineering showed that well depths ranged from 38 to 338 feet with an average depth of 151 feet. The static water level in these wells ranged from 3 to 200 feet. Initial production values ranged from 7 to 120 gallons per minute. The drillers' reports typically describe layered sediments that include boulders, gravel, sand, silt and clay. Almost all wells in the vicinity of the South Fork Payette River penetrated coarse-grained sediments, with some reports noting varying thicknesses of interbedded fine-grained sediments. Some deeper wells and wells along the valley margins penetrated granite rocks, generally described as solid or fractured granite.

No ground water quality data has been developed or collected at this site. The South Fork Payette River is located immediately down gradient of the recharge and irrigation units, less than 500 feet away. A ground water impact assessment was not required for this project because 1) there is no ground water use downgradient of recharge areas, 2) the downgradient area is controlled by the permittee, and 3) all shallow ground water will ultimately discharge to the Payette River past the point of compliance (i.e., Southfork Landing's property boundary).

The infiltration rate of soils near the ground water recharge basin site was reported to be 2.4-3.9 inches/hour, as determined from percolation tests onsite. Assuming that only 50% of the total subsurface recharge basin area

will be actively used at any time (0.25 acres), approximately 390,960 gallons could potentially be discharged to the subsurface basins per day. Based on the infiltration rates and proposed average daily reclaimed water production rate of 67,000 gallons/day, the site has adequate capacity to handle the design flow rate of the membrane biological reactor discharge. It should be noted that the irrigation/recharge basin also constitutes an additional 0.25 acres of infiltration area during the growing and non-growing seasons. Thin layers of clay and clayey sand have been observed in the area of the recharge basins, and could limit infiltration. To ensure there is no direct surface water discharge of reclaimed water, removal of these finer grain materials during basin excavation or expansion to a secondary recharge area may be needed. This was also verified by the test pit results.

Projected Wastewater Quality and Loading Rates

Wastewater Quantity:

The initial phase of PUD will consist of approximately 220 equivalent dwelling units (EDUs) by the end of 2012, approximately the end of the 5-year reuse permit life. Estimated flow per EDU is 300 gpd. Average daily flow of the wastewater is 0.067 mgd. This estimation is thought to be conservative; actual flow data will be monitored once the facility is operating and the results will aid in planning for future phases of the facility. Peak daily flow and peak hourly flow were estimated by multiplying the average daily flow by 2.0 and 4.0, resulting in projections of 0.132 mgd and 0.264 mgd, respectively.

Wastewater Quality:

Wastewater reuse quality is a concern for both irrigation and ground water recharge. Recharge will occur year-round, while landscape irrigation will take place only during the growing season (April through September). As ground water recharge requires stricter effluent quality, constituent concentrations and projected wastewater loadings (refer to Table 2) will be limited to the recharge limits contained in the *Reuse Rules*. Additional Class A effluent quality criteria are also based on requirements from the *Reuse Rules*. The projected influent wastewater loadings are based on typical characteristics for residential wastewater.

Table 2: Projected influent wastewater loadings design value and Class A effluent quality criteria

Parameter	Projected Loading Rates (lbs/person)	Effluent Concentrations
5-day Biochemical Oxygen Demand (BOD_5)	0.17	< 5.0 mg/l
Total Suspended Solids (TSS)	0.19	< 5.0 mg/l
Total Nitrogen (TN)	0.0059	< 10.0 mg/l
Total Phosphorus (TP)	0.0294	< 1.0 mg/l
Turbidity		< 0.2 NTU
Total Coliform		< 2.2 cfs/100ml
pH		6.0-9.0

Projected Permit Limits, Hydraulic Loading Rates:

Table 3 lists the Irrigation Water Requirement (IWR) for pasture grass and the estimated effluent production. The Precipitation Deficit, or IWR, for pasture grass in Garden Valley can be found at this website: http://www.kimberly.uidaho.edu/ETIdaho/stninfo.php?station=103448.

Table 3: Irrigation Water Requirement for 10 Acres of Pasture Grass in the Garden Valley Area

	IWR	IWR	WW production	Recharge Volume
	in/mo	MG/mo	MG/mo	MG/mo
Apr	0.78	0.21	1.66	1.45
May	2.67	0.73	1.71	0.98
Jun	3.94	1.07	1.66	0.59
Jul	5.10	1.11	1.71	0.60
Aug	4.36	1.18	1.71	0.53
Sep	1.93	0.52	1.66	1.14
Total	18.78	4.82	10.1	5.28

Source: Allen, Richard G. and Clarence W. Robison, 2006 (Revised 2007). *Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, Research Technical Completion Report*, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

The data in Table 3 shows that the rate of generation of reuse water will exceed the demand for irrigation water during the growing season. The excess wastewater will be discharged to the recharge basins. Another 10.05 MG wastewater will be discharged to the recharge basins from October to March of each year, when irrigation is not allowed.

The infiltration capacity of the soils at the recharge basins is thought to be 2.4-3.9 inches/hour. The proposed initial application rate at the ground water recharge area is designed to be less than the soil infiltration capacity. The proposed size of both subsurface recharge basins is 0.5 acres, with equal sizes of 0.25 acres each; therefore, approximately 0.39 MG wastewater could potentially be infiltrated daily. The irrigation/recharge basin will also be used to infiltrate effluent on a year-round basis, and increases the potential infiltration rate of the system. The clay and sandy clay layers in some areas may limit the downward flow and may need to be over-excavated and backfilled with sand and gravel material. If unexpected hindrances in infiltration occur due to soil conditions, a secondary recharge area will be added to the system. Additionally, a 7-day pond will be built to hold off-spec wastewater. The recharge system will be sized and operated to prevent direct discharge of the Class A reclaimed water to surface water. **Staff recommends that the volume of reclaimed wastewater applied for irrigation be monitored daily during growing season and reported monthly total and average daily flow. Staff also recommends that the total volume of reclaimed wastewater applied to the ground water recharge basins be recorded daily on a year-round basis and reported as a monthly total and average daily flow.**

Permit Limits, Constituents:

Nitrogen:
Nitrogen in the treated effluent is anticipated to enter ground water primarily during the non-growing season through the recharge system. The Payette River forms a downgradient boundary approximately 500 feet below the recharge system site. There is no ground water quality data available for the site, and no impact assessment was included in the permit application because 1) there is no ground water use downgradient of recharge area, 2) the downgradient area is controlled by Southfork Landing, and 3) all shallow ground water will ultimately discharge to the Payette River as it moves past Southfork Landing's property boundary against the river.

During the growing season, nitrogen in the reuse water will be taken up by the grass being irrigated. The *Reuse Rules* allow a maximum, total nitrogen concentration of 30 mg/L in Class A reuse waters used for irrigation; however, because the reuse water will also be used for recharging ground water on a year-round basis, the

maximum concentration allowed in the permit will be 10 mg/L, for both irrigation and recharge applications. **Staff recommends that Total Nitrogen (i.e., nitrite+nitrate+TKN) be limited to 10.0 mg/L, and that Total Nitrogen be monitored in the effluent weekly at the point of compliance.**

Phosphorus:
Southfork Landing has proposed to treat effluent to achieve phosphorus concentrations to 1 mg/L prior to discharge to the reuse facilities. DEQ notes that effluent discharged to the recharge basins will travel into shallow ground water, and will ultimately be discharged into the South Fork of the Payette River. Although phosphorous discharged into the basins is likely to be retained within the soil profile until breakthrough occurs, it was assumed that this phosphorous load will ultimately be discharged into the river over the life of the project. DEQ notes that Southfork Landing has applied for an NPDES permit to allow for direct discharge to the river in the future.

As previously indicated, the South Fork Payette River is classified as a Special Resource Water under the *Water Quality Standards* (IDAPA 58.01.02). In order to assess the impacts of these effluent discharges to the river (i.e., with respect to the Special Resource Water provisions), Southfork Landing submitted a mixing zone analysis for temperature, ammonia, phosphorous, and dissolved oxygen. Based on a review of the analysis, DEQ's Water Quality Program Office determined that the proposed 1 mg/L phosphorous discharge is unlikely to result in any adverse impact to existing water quality, as stipulated by the Special Resource Water provisions. This assessment is sufficient to establish phosphorous concentration limits for the draft reuse permit; however, DEQ notes that the pending NPDES permit could contain different and/or more stringent limits for phosphorous. Consequently, the reuse permit contains a re-opener clause that requires Southfork Landing to re-assess and recommend an appropriate phosphorous discharge limit for the reuse permit, after final issuance of an NPDES permit from EPA. This will allow for consistency between permits, and will also ensure adequate water quality protection.

Test pits results showed that soil phosphorus concentration is 4.06 to 7.31 mg/kg in the top 7 feet around the recharge area. Since no ground water quality data is available for this site, impact of the Class A effluent on shallow ground water is unknown; however, DEQ notes that there is currently no ground water standard for phosphorous, and all shallow ground water will ultimately discharge to the river. Consequently, the phosphorous concentration limit should be based upon potential surface water impacts. **Staff recommends that Total Phosphorus be limited to 1.0 mg/L, and that Total Phosphorus be monitored in the effluent weekly at the point of compliance. Staff additionally recommends that the permit contain a compliance activity (i.e., CA-214-05) to re-assess the appropriate phosphorous concentration limit contained in the reuse permit, within 60 days of issuance of a final NPDES permit from EPA.**

5-day Biological Oxygen Demand (BOD_5):
The draft permit limits 5-day Biological Oxygen Demand (BOD_5) as required by the *Reuse Rules*. The draft permit reads as follows: "Five-day Biological Oxygen Demand (BOD_5) shall not exceed 5 mg/L based on monthly arithmetic mean as determined by weekly composite sampling". **Staff recommends that of the permit requires that BOD_5 be sampled on a weekly basis at the monitoring point following disinfection and prior to the ground water recharge basin**.

Turbidity:
The disinfection requirements for Southfork Landing follow the requirements set out in the *Reuse Rules* for a wastewater treatment facility utilizing membrane filtration and producing Class A reuse water. The permit states the requirement as "the daily arithmetic mean of all daily measurements shall not exceed 0.2 NTU, and turbidity shall not exceed 0.5 NTU at any time. Turbidity measurements shall be taken post-filtration and pre-disinfection."

Staff recommends that turbidity be continuously monitored with a turbidimeter. If at any time the effluent exceeds 0.5 NTU for more than 5 minutes, the effluent will be automatically routed back to one of the other treatment trains to be retreated prior to discharge.

Capacity of Wastewater Treatment System

Wastewater applied to landscape irrigation will meet the IWR of the local pasture grass. Total amount of wastewater generated during irrigation season will exceed IWR by 5.28 MG; this excess reclaimed wastewater will be discharged to the recharge system. During the non-growing season, when irrigation is not allowed, all reuse water generated will terminate in the recharge basins. This is another 10.05 MG wastewater. The basins will need to be capable of accepting the full amount of water generated equal to 67,000 gpd. Soil test pits results showed that the recharge basins percolation rates are 2.4-3.9 inches/hour. At the size of 0.25 acres of the recharge basin (each), 0.78-1.27 MG wastewater can potentially be infiltrated daily. The capacity of the recharge basin will be able to accept the proposed wastewater amount. However, soil test pits results showed that some area around the recharge basins have clay and sandy clay layers, which may hinder the infiltration of the effluent. The basins may need to be over-excavated and backfilled with sand and gravel material. If any unforeseen hindering of infiltration happens, a secondary recharge area shall be added to the system.

Disinfection

The draft permit includes disinfection limits as set out in the *Reuse Rules*. This permit limit is written as follows: "the median number of total coliform organisms shall not exceed 2.2 CFU/100mL and shall not exceed 23 CFU/100 mL in any confirmed sample, as determined from the bacteriological results of the last 7 days for which the analysis has been completed". **The monitoring section of the permit requires that coliform be sampled daily at a point following disinfection.** An accepted UV disinfection process will be installed to meet this and the 5-log virus disinfection requirement in the Rules. Class A wastewater does not have a residual chlorine requirement in instances where UV disinfection is utilized.

The UV disinfection system shall be operated in accordance with the manufacturer recommendations at all times. If at any time the treatment facility does not meet disinfection requirements, the effluent will be automatically routed back to one of the other treatment trains to be retreated prior to discharge.

Buffer Zones and Postings

No drinking water wells are to be installed within 100 feet of any irrigation sites, or within 1000 feet down gradient of the recharge basins, in accordance with IDAPA 58.01.17.600.08 and 601.08.d, respectively. Where the reclaimed water is stored or impounded, or used for irrigation in public areas, warning signs shall be posted at a minimum of 500 foot intervals and at the entrance if there is a surrounding fence, or if there is no fence, at 250 foot intervals and at all accessible points. The warning signs will read "Warning: Reclaimed Wastewater – Do Not Drink" or equivalent in both Spanish and English.

Site Management

Pending and/or ongoing permitting issues that need to be addressed after final permit issuance are addressed in the draft permit as Compliance Activities in Section E. The permittee is required to submit to DEQ for review and approval a Plan of Operation, a Runoff Management Plan, and an Operator Education Plan. Once approved, these plans will be included by reference into the permit and be enforceable as part of the permit.

The Plan of Operation is intended to be a comprehensive guide for the overall management and day-to-day operation of the site relevant to reuse water. The plan is expected to specifically address the requirements of the

reuse permit in an operational guide manner. All sampling and monitoring procedures should be thoroughly addressed, and QA/QC procedures written out. The procedure for handling off specification effluent (routing to another train for retreating) and maintenance the UV lamps to ensure that viral inactivation is being met shall be specifically addressed. At a minimum, design, operation, and maintenance procedures shall be addressed for minimizing the potential for odors, anticipating the need for maintenance of the recharge basins, and the procedure for periods of shutdown and low flow. A waste solids management plan describes how waste solids generated at the facility will be handled and disposed of to meet the requirements of the draft permit Section I, No. 5. In addition, the Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater has a checklist in Appendix A.12 that should be used as a guide for developing the Plan of Operation. The plan shall be submitted at or before 50% completion of the reuse facility construction, and an updated plan is due 60 days after the first complete year of operation.

Prior to the application of reuse water, the draft permit requires that a Runoff Management Plan be submitted as a compliance activity. The plan is required to prevent runoff from the reuse sites to any property not owned by the permittee. The Plan shall address BMPs and any other control structures designed to achieve this purpose.

Upon completion of construction of the reuse areas, the permittee should submit a scaled site map delineating land use, recharge basins, reuse areas, wells, streams/canals, wetlands, ponds and any BMPs constructed. The requirements of the site maps are in IDAPA 58.01.17.300.05.e.

An Operator Education Plan shall also be developed that outlines how the permittee will endeavor to educate home owners and any other operator of the reuse water system, as required by IDAPA 58.01.17.601.08.g. Operators are anyone, including home occupants, who utilize a combination of effluent and other irrigation waters. Operators shall be required to sign a utility user agreement provided by the utility providing the reuse water which states that the user understands the origin of the effluent and the concept of agronomic rate for applying the effluent. The plan shall include the utility use agreement, and a plan to undertake a public education program to teach potential customers the benefits and responsibilities of using Class A effluent.

Plans and specifications for irrigation piping are required by the draft permit. The plans shall show that the required separation distances between drinking water, waste water, and reuse water pipes are met. The plans shall also include any exterior drinking fountains, picnic tables, food establishments, and other public eating facilities to ensure that they are placed out of the spray irrigation area where reuse water is used. All exposed and above ground piping, risers, fittings, pumps, valves, etc. shall be painted purple, Pantone 512. In addition, all piping shall be identified using an accepted means of labeling reading “Warning: Reclaimed Water – Do Not Drink” in both Spanish and English lettering. In a fenced pump station area, signs shall be posted on the fence on all sides.

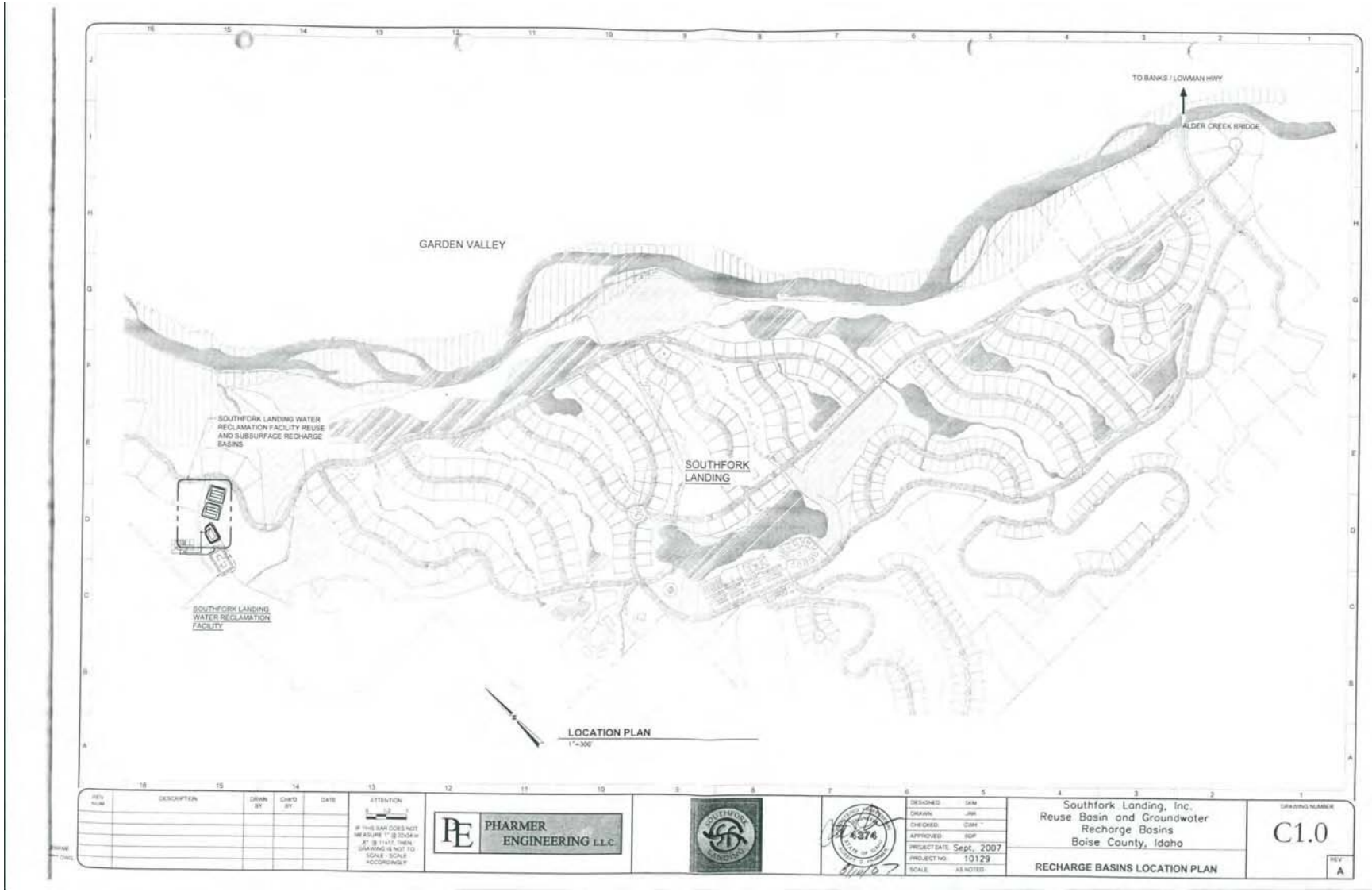
Recommendation

DEQ staff recommends issuance of the draft permit for public comment. The draft permit addresses disinfection requirements, constituent concentrations, and wastewater treatment plant performance. Monitoring and reporting requirements to evaluate the system performance and to determine permit compliance have been specified. Compliance activities, as recommended in the staff analysis, are incorporated in Section E of the permit.

References

1. Pharmer Engineering and HYQUAL, May 7, 2007. Application for Water Reuse Permit.
2. DEQ, 2007, Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater.

Appendix 1 Site Map



Appendix 2 Southfork Landing Reuse and Ground water Recharge Basin Map